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Surgical Treatment of Fractures of the Tibial Shaft

by

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Since Küntscher's extensive work of the intramedullary nailing, the method of closed reduction and of blind nailing under the radiological control much prevailed even in our country. Our first experience of the intramedullary nailing was in 1956, employing a rush rod with the fracture exposed. As we aimed at the minute reduction of fragments and its maintenance in the surgical treatment of fracture, we usually exposed the fracture site. Then, we have now some problems to be reckoned upon, reviewing our experience of ten years and more. The problems are as follows;

1) Exposure or non-exposure of fracture when performed the intramedullary nailing.
2) Intramedullary nailing and wiring.
3) Other method of surgical treatment such as screwing.

MATERIAL

68 patients with fracture of the tibial shaft were surgically treated in our clinic from 1956 to 1966. 61 patients were male and 7 were female. The affected legs of 38 patients were of right side and those of 30 were of the left side. 44 cases were of closed fracture and 24 were of open fracture. The age distribution of the patients was widespread with a predilection in the twenties and thirties (Table. 1). A variety of accident is responsible for the injury but the traffic accident is above all predominant. In our series, the most important factor of the injury was the accident while driving the motor cycle (Table 2).

The method of the internal fixation depends largely upon the type and level of

Table 1 Age distribution

0～ 9 yrs.	2
10～19 yrs.	8
20～29 yrs.	20
30～39 yrs.	17
40～49 yrs.	10
50～59 yrs.	7
60～69 yrs.	4
	68

Table 2. Type of accident.

1) Traffic accident	46
motor cycle	26
hit by car or motor cycle while walking	8
unknown	6
car	5
bicycle	1
2) Falls from a height	5
3) Industrial	8
4) Sport	2
5) Stumble and Fall	3
6) Hit the leg in home	1
7) Unknown	3

fracture. Recently we prefere the intramedullary nailing with Küntscher nail of cloverleaf section and also the screwing. As to the level, fracture of the middle third of the tibia is indicated for intramedullary nailing and some cases of fracture between upper and middle thirds and between middle and lower thirds of the tibia are also indicated for the method. As to the type of fracture, the method is applied in transverse, comminuted and sometimes oblique fractures. The level and type of fracture in our series are shown in Table 3 and 4. Then, the range of indication for the intramedullary nailing is wide involving many cases of fracture of the tibial shaft. However, osteosynthesis was performed in many cases, though less than those of intramedullary nailing, by means of screwing. Spiral and oblique fractures are indicated for the method. The minute reduction and its maintenance by screwing afford the early consolidation of fragments.

A few cases were treated by other methods ; wiring, three cases : screwing with a plate, one case (Table 5). Of three cases treated by wiring, bone fusion was attained in one case and two cases were reoperated, respetively intramedullary nailing with rush rod and screwing performed with good results. In one case, screwing with a plate was carried out with satisfactory result.

Table 3. Level of fracture

Upper third	5 (8.3%)
Between upper and middle thirds	3 (5.0%)
Middle third	27 (45.0%)
Between middle and lower thirds	15 (25.0%)
Lower third	10 (16.7%)
Total	60 cases

Table 4 Type of fracture

Transverse	16 (25.4%)
Oblique	14 (22.2%)
Spiral	3 (4.8%)
Comminuted	30 (47.6%)
Total	63 cases

Table 5. Method of internal fixation

Intramedullary nailing (43 cases)	
Rush rod	22
Küntscher nail of V-section	5
Küntscher nail of cloverleaf section	16
Screwing	21
Wiring	3
Screwing with plate	1

INTRAMEDULLARY NAILING

Rush rod was employed as the nail of intramedullary fixation since 1956, Küntscher nail of V-section since 1962 and Küntscher nail of cloverleaf section since 1963 in our clinic. Küntscher nail of V-section was broken in one case during the course of postoperative treatment in 1964. Thereafter, the Küntscher nail of cloverleaf section was chiefly adopted. The proximal part of the nail is prealably bent in a slight degree and the distal tip is pared obliquely.

1) Technique : Fracture is exposed by means of a curved skin incision. The periosteum is stripped at the site of fracture and, in the case of comminution, small fragments are prealably attached to the distal or proximal fragment by means of wiring. The nail of large calibre (chiefly the Küntscher nail of cloverleaf section) is introduced into the medullary cavity at the site of fracture and the nail of appropriate calibre is chosen, which may be easily introduced into the cavity without extensive reaming. The reaming, when necessary, is restricted to an extent as few as possible. The site of nail insertion is then prepared. Usually a small incision is laid down on the proximal and lateral part of the tuberositas tibiae to which inserts the patellar tendon. The tendon drawn medially and a small part of its insertion detached, a small hole is opened in the proximal and lateral part of the tuberositas tibiae with a chisel. The knee maximally flexed, a reamer is introduced through the hole and the reaming is carried out so as to ream the inner part of

the tuberositas and its proximity. At that time, the direction of the reamer must be such as would be easily introduced the nail. The range of reaming is a few not so far as to reach the site of fracture. Then, the nail is introduced through the hole into the medullary cavity until its distal tip appears at the distal end of the proximal fragment. After the minute reduction of fracture, the nail is further introduced into the medullary cavity of the distal fragment, while the reduction is firmly maintained with forceps and, if necessary, by means of wiring. If the intramedullary nailing seems to suffice for the maintenace of the third fragment, the wire is withdrawn before the wound closure or after the reparation of the soft tissues. Otherwise, the wire is left in situ until the consolidation of the broken bone. When intramedullary nailing fails to obtain a firm fixation, supplementary metal is often used, such as Kirschner wire, staple and so on.

2) Postoperative management : The affected leg is elevated after surgery. The external fixation with plaster of paris cast is sometimes neglected especially when the internal firm fixation was obtained with a nail of large calibre. But the external fixation with plaster of paris cast ought to be routinely carried out from the middle part of the thigh to the toes. Although the internal firm fixation may need no further external fixation on the mechanical point of view, plaster of paris cast is required for the rest and protection of the soft tissues more or less damaged by the injury and surgical intervention. Indeed, even if the intramedullary nailing seems to be an excellent method with no requirement of the external fixation at a glance, the advantage of the method does not consist in no requirement of plaster of paris cast but in the early weight-bearing and the certainty of bone fusion. Then, the plaster of paris cast is cut off after the repair of the soft tissues usally two weeks after surgery. Thereafter, the patients are encouraged to move actively the ankle and knee joints in order to improve the local circulation. Physical therapy such as hot bath is also prescribed. But the swelling of the foot and leg must be carefully controlled and it is to be surpassed by means of the elevation of the affected leg when it occurs. The beginning of weight-bearing is of variety according to the individual cases. It is determined by the level and type of fracture and also by the firmness of the internal fixation. When fracture is transverse in the middle third of the tibia and the reduction is maintained with a nail of large calibre, the weight-bearing is prescribed after the repair of the soft tissues under the careful control of swelling. Otherwise, the period of weight-bearing is determined with the radiological control.

3) Results and complication :

(1) Open fracture (13 cases).

Infectious complication was already detected before surgery in two cases, of which one case was accompanied by tetanus in the course of preoperative treatment. After the subsidence of tetanus and infection, the intramedullary nailing was performed with the nail of cloverleaf section. Another case with infectious complication is illustrated below (Case 4). A mild infection was observed in one case of the remainder eleven cases 3 1/2 months after surgery. The patient consulted other institution and disappeared. Satisfactory results were obtained in ten cases without any complication.

(2) Closed fracture (30 cases).

Infectious complication was observed in two cases after surgery. In one case, postoperative osteomyelitis subsided after the withdrawal of the intramedullary nail and seque-

strectomy. In another case, the proximal tip of the nail had broken the skin and infectious arthritis of the knee joint occurred. For the knee joint was exposed in order to insert the nail in the early stage of our experience. However, infectious complication subsided after the aspiration of pus and administration of antibiotics. Then, solid fusion of fracture was obtained. Satisfactory bone fusion was obtained without any complication in the remainder twenty-eight cases.

3) The interval from surgery to solid bone fusion.

The interval from surgery to solid fusion was investigated in those fifteen cases which were radiologically followed up every month after surgery (Table 6). In the majority of cases, a periostal callus formation (so called fumée de cigarette) was at first observed on the roentgen film taken after surgery. Then, bone fusion was detected. When it is observed, though slightly, we term it the beginning of consolidation. Thereafter, solid bone fusion was evidenced on the roentgen films. The interval from surgery to the beginning of consolidation was from two to five months (average ; 3.6 months) and that

Table 6

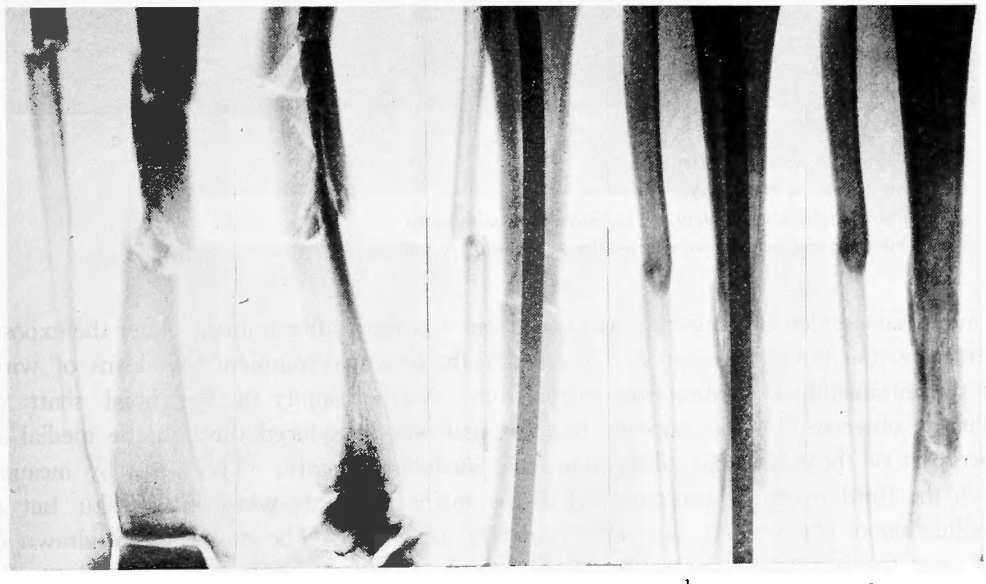
Patient	Age	Sex	Fracture		Nail	From surgery to solid bone fusion (in months)	
			Level	Type		(+)	(卄)
1. N.M.	50	m.	Upper third	Transverse	R.	3	4
2. R.M.	58	m.	Middle third	Oblique	R.	4	6
3. T.S.	52	m.	Between middle & lower thirds	Oblique	V	3	5
4. H.T.	16	m.	Between middle & lower thirds	Comminuted	R.	2	3
5. T.H.	33	m.	Between middle & lower thirds	Oblique	V.	3	4
6. H.U.	22	m.	Middle third	Transverse	C	4	6
7. S.N.	20	m.	Between upper & middle thirde	Transverse	C	5	6
8. K.H.	21	m.	Middle third	Transverse	V.	2	4
9. M.I.	28	m.	Middle third	Comminuted	C.	5	6
10. H.A.	28	m.	Middle third	Comminuted	C	3	4
11. T.S.	18	m.	Lower third	Transverse	C.	4	5
12. Y.S.	32	m.	Middle third	Comminuted	C.	3	6
13. N.N.	45	m.	Middle third	Comminuted	C.	4	5
14. K.O.	25	m.	Middle third	Comminuted	C.	5	6
15. K.H.	21	m.	Middle third	Comminuted	C.	4	5

(+) : The beginning of consolidation. (卄) : Solid bone fusion.
R. : Rush rod. V. : Küntscher nail of V-section.
C. : Küntscher nail of cloverleaf section.

from surgery to solid bone fusion from three to six months (average ; five months) in our fifteen cases.

CASE REPORTS

Case 1. A man aged twenty-eight suffered from open fracture of the tibial shaft, head injury, fractures of the mandible and the right clavicle due to the motor car accident. The unconsciousness continued several days after injury. One month after injury, surgery was carried out. After the exposure of fracture, a small fragment was attached to the proximal fragment by means of wiring and then the intramedullary nailing with a nail of cloverleaf section was carried out. As the intramedullary nailing was judged to be sufficient for the maintenance of reduction, the wire was withdrawn before wound closure. Two weeks after surgery, physical therapy with hot bath was commenced. Eleven months after surgary, the nail was withdrawn (Fig. 1-a, b, c, d & e).

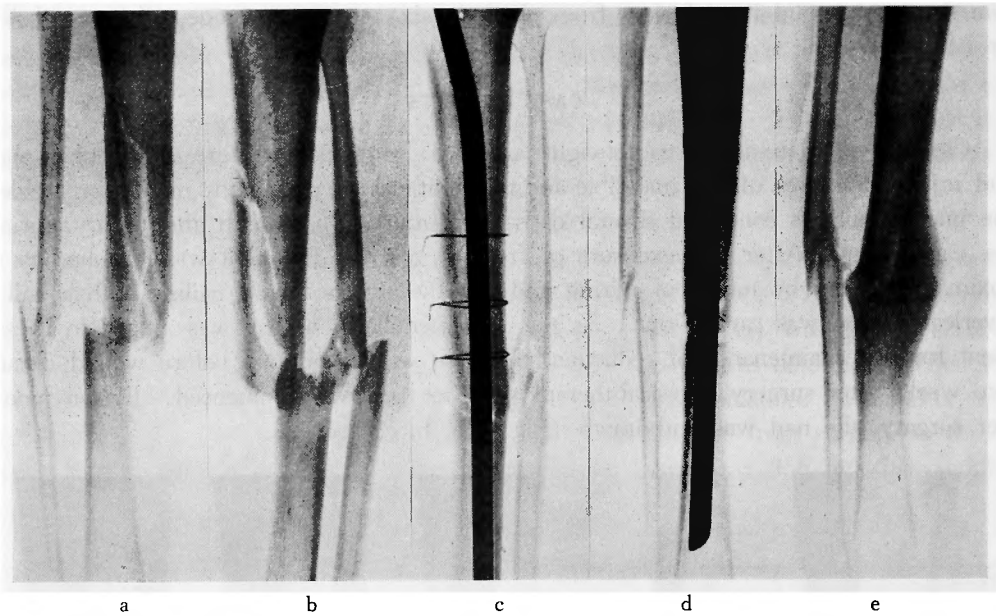


a b c d e

Fig. 1 Case 1. a & b. After injury.
c. After surgery. The third fragment was prealably attached to the proximal fragment by means of wiring. The wire was withdrawn before the wound closure.
d. Eleven months after surgery.
e. One year after the intramedullary nailing.

Case 2. A man aged twenty-eight suffered from comminuted fracture of the right tibial shaft due to a traffic accident while driving a motor cycle. Ten days after injury, surgery was carried out. After the exposure of fracture, the third fragment was attached to the proximal fragment by means of wiring and then the intramedullary nailing with a nail of cloverleaf section was performed. The wire was withdrawn two months after surgery. One month thereafter, physical therapy was commenced. The nail was withdrawn one year five months after the intramedullary nailing (Fig. 2-a, b, c, d & e).

Case 3. A man aged forty-five suffered from fracture of the left tibial shaft due to



a b c d e

Fig. 2 Case 2. a & b. After injury.
c. One month after surgery.
d. Two months after surgery. The wires were withdrawn.
e. One year and seven months after the intramedullary nailling.

an industrial accident. Surgery was carried out ten days after injury. After the exposure of fracture, the third fragment was attached to the proximal fragment by means of wiring and the intramedullary nailing was carried out. As the valgity of the tibial shaft was evidently observed in the opposite leg, the nail was introduced through the medial and upper part of the tuberositas tibiae into the medullary cavity. The wires by means of which the third fragment was attached to the main fragments were left in situ but the consolidation of the broken site was evidently observed. The nail was withdrawn one year after the intramedullary nailing (Fig. 3-a, b, c, d, e, f, g & h).

Case 4. A man aged twenty-three had open fracture of the left tibia with severe injury of the soft tissues and bones while driving a motor cycle. At injury, the third and fourth fragments of the tibia protruded through the wound. A mild infection developed and the period of the wound healing was lengthened. Two months after injury, the intramedullary nailing and bone graft were performed, which osteomyelitis of the tibia followed. Then, the nail was withdrawn and surgery was carried out for osteomyelitis ten months after the first surgery. Osteomyelitis subsided after the administration of antibiotics and radical operation for pseudarthrosis was carried out nine months after the second surgery. A Rush rod was inserted into the medullary cavity of the tibia and the defect of the tibia was filled with grafted bone, which was fixed by means of wiring. Thereafter, no evidence of relapsed osteomyelitis was detected and a radiological examination revealed bone fusion. The nail was withdrawn one year after the previous intramedullary nailing (Fig. 4-a, b, c, d, e, f, g, h & i).

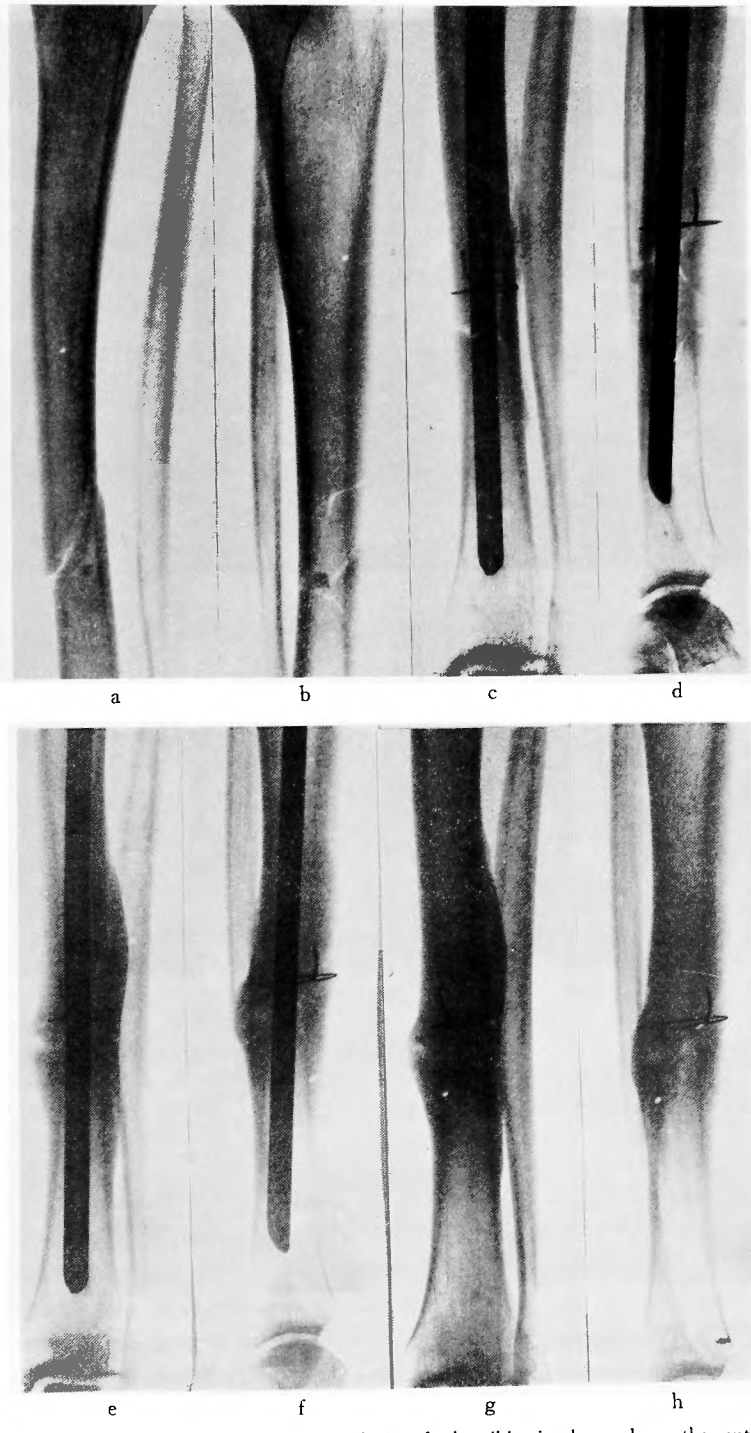
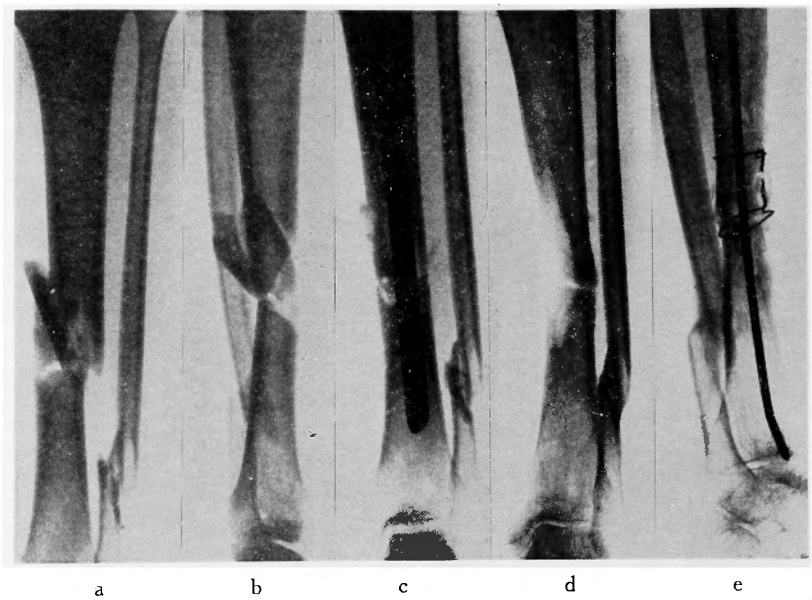


Fig. 3 Case 3. a & b. After injury. The valgity of the tibia is observed on the anteroposterior roentgenogram (a).
c & d. Two months after surgery.
e & f. Eleven months after surgery.
g & h. One year and one month after the intramedullary nailing.



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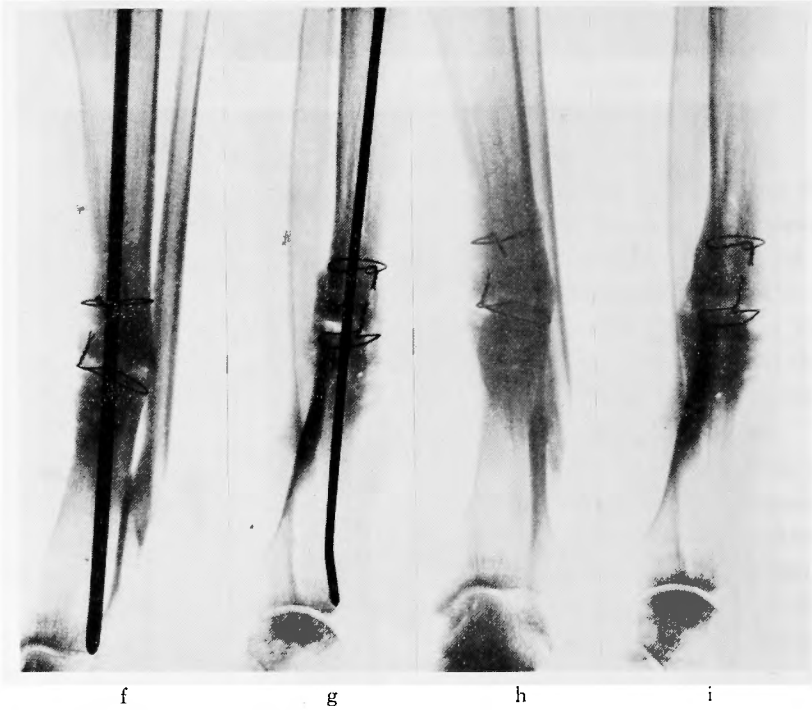


f g h i

Fig. 4 Case 4. a & b. After injury.

c. Two months after intramedullary nailling with bone graft.

d. One year and two months after the first intervention. Five months after the operation for osteomyelitis.

e. Osteomyelitis subsided, intramedullary nailing with a dia-pin and bone graft were performed one year eight months after injury. The grafted bone was attached to the main fragments by means of wiring.

f & g. Seven months after the previous. surgery.

h & i. One year and one month after the previous intramedullary nailing.

Case 5. A man aged thirty-eight suffered from closed spiral fracture of the right tibia in the region between its middie and distal thirds. Intramedullary nailing was performed on the following day. Two pieces of Kirschner wire were also inserted at the site of fracture for the maintenance of reduction. However, the consolidation was largely retarded. The beginning of the solid bone fusion was radiologically confirmed five months and solid bone fusion ten months after surgery. The nail was withdrawn two years three months after the intramedullary nailing (Fig. 5-a, b, c, d & e). This was the case indicated for screwing rather than intramedullary nailing. The retardation of bone fusion is chiefly ascribed to the failure of minute reduction of fragments.

a b c d e

Fig. 5 Case 5. a & b. After injury.
c. After surgery. The reduction was not sufficient.
d. Two years and three months after the first intervention.
e. After the withdrawal of the nail. This was the case indicated for the screwing rather than the intramedullary nailing.

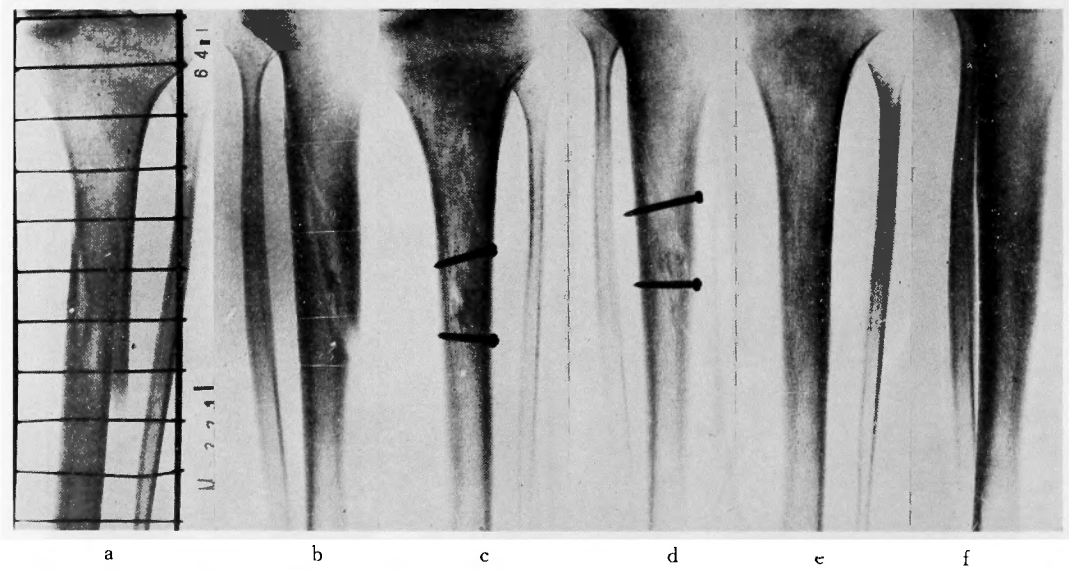
SCREWING

Internal fixation was performed by means of screwing in twenty-one cases (transverse type, 2 : oblique or spiral, 10 : comminuted, 9). In nineteen cases of the twenty-one, solid bone fusion was obtained at the site of fracture but, in two cases, the procedure produced pseudarthrosis due to unsatisfactory fixation of comminuted fragments. In one case of the latter, intramedullary nailing was prescribed but the patient disappeared. In the other, intramedullary nailing was performed but the patient died from cerebral malacia in the course of after-treatment.

Onlay bone graft with screwing was carried out in three cases. In one case of these three, fracture was of severe comminution in the level of the distal third of the tibia.

Six months after injury, the procedure was performed. The remainder two cases were first seen in our clinic four and six months respectively after injury and the first surgery applied was onlay bone graft with screws.

Case 6. A man aged twenty-five with open fracture of the left tibial shaft due to traffic accident. Internal fixation was performed by means of screwing two weeks after injury. The patient was allowed to walk with the leg immobilized in a plaster of paris cast two months after surgery. The screws were withdrawn five months after surgery. This is a case in which the ideal reduction of fracture and its maintenance by means of screwing were attained and, as consequences, no superfluous callus formation was observed (Fig. 6 a, b, c, d, e, & f).



a b c d e f

Fig. 6 Case 6. a & b. After injury.
c & d. Two months after surgery.
e & f. Eight months after the screwing.

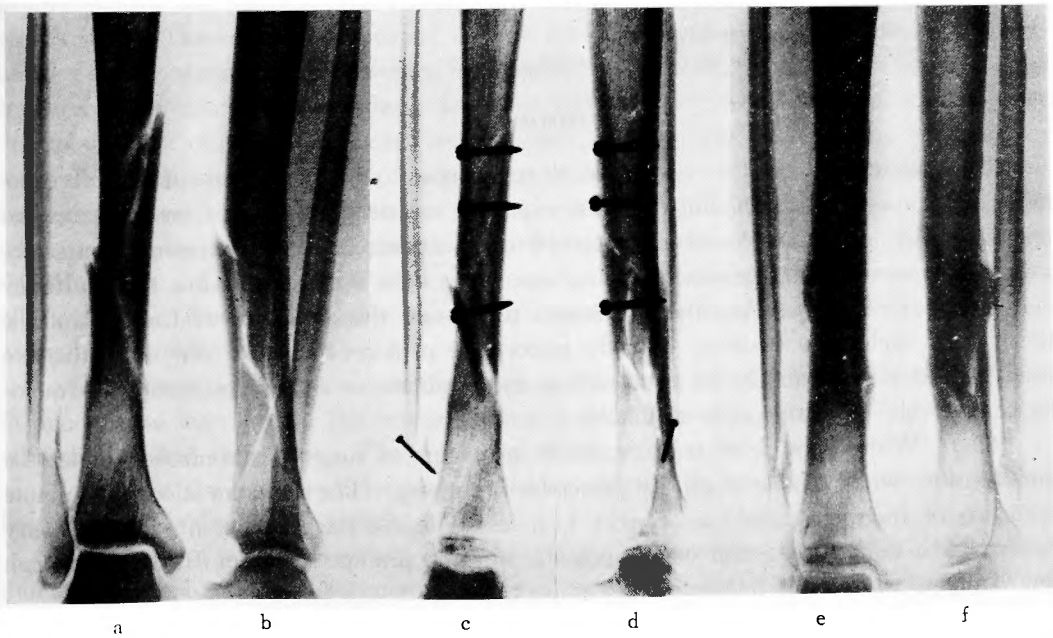
Case 7. A man aged forty with comminuted open fracture of the left tibial shaft due to traffic accident. Surgery was carried out three weeks after injury. Internal fixation was attained by means of screwing after minute reduction of fragments. The patient was allowed to walk with the leg immobilized in a plaster of paris cast ten weeks after surgery. The screws were withdrawn seven months after surgery (Fig. 7-a, b, c, d, e & f).

Case 8. A man aged thirty-four with fracture of the right tibial shaft due to fall from a height. Internal fixation was performed by means of screwing two weeks after injury. The patient was allowed to walk five weeks after surgery. The screws were withdrawn 2 1/2 months after surgery (Fig. 8-a, b, c, d, e & f).

Case 9. A woman aged twenty-four with fracture of the right tibial shaft due to the accident while skating. Surgery was carried out one week after injury. Osteosynthesis was performed by means of screwing after minute reduction of the fragments. The

a b c d e f

Fig. 7 Cafe 7. a & b. After injury.
c & d. After surgery.
e & f. Eighht months after the first intervention.



a b c d e f

Fig. 8 Case 8. a & b. After injury.
c & d. Two months after surgery.
e & f. Six months after the first intervention.

bony consolidation was attained without superfluous callus formation. The screws were withdrawn 2 1/2 months after surgery. The wound healing was much delayed, which was ascribed to the failure of skin incision. The linear skin incision was laid down on the anteromedial aspect of the right leg (Fig. 9-a, b, c, d & e).

a b c d e

Fig. 9 Case 9. a. After injury.
b & c. One month after surgery.
d & e. Four months after the first intervention.

COMMENT

1) Exposure of fracture : It would be superfluous to expose fracture if closed reduction and intramedullary nailing without exposure are easily performed, as were insisted upon by many authors. However, the problem of exposure and non-exposure of fracture site is not essential in the treatment of fracture. It is to be decided according to the efficacy of the procedure. There is either no reason to restrict the problem to fractures of the tibial shaft, exclusively insisting upon the importance of non-exposure. We think that we need not carry out routinely the blind nailing under minute or sometimes meticulous radiological control. The reason is as follows ;

(1) With exposure of fracture, every procedure at surgery is controlled under the direct vision, which is one of general principles in surgery. The exposure allows the minute reduction of fragments and can restrict to a lesser degree the reaming in the medullary cavity. The minute reduction is indispensable for the prompt repair of fracture, although few damages to the soft tissues is very important.

(2) The interval from surgery to solid bone fusion is said to be slightly more lengthened in the cases with exposed fracture than that in the cases with unexposed fracture. However, it is not the matter of question on the practical point of view. For

the intramedullary nailing affords the firm internal fixation and it allows early weight-bearing.

(3) The intervention to the soft tissues due to the exposure may augment the danger of infectious complication especially in the cases of open fracture. But the onset of infectious complication is not only determined by the exposure but also by many other factors; the duration of exposure at surgery, interval from injury to surgery, skilfulness of management after injury. In fact, the majority of cases with open fracture healed without infectious complication, although fracture was exposed.

2) Intramedullary nailing and wiring: It had been vaguely thought that the wiring hindered the periostal callus formation and accordingly bone fusion due to vascular disturbances. So we kept the cautious attitude against the wiring and investigated clinically under the following items the effect of wiring in the cases of comminuted fracture in which intramedullary nailing was performed.

(1) Transient wiring for the purpose of the reduction of the third fragment and withdrawal of the wire before wound closure (Case 1).

(2) Transient wiring for the maintenance of the third fragment and withdrawal of the wire after the repair of the soft tissues and bone fusion of the third fragment (Case 2).

(3) The wire is left in situ until the solid bone fusion is obtained (Case 3).

The results were, as shown in the three cases above mentioned, satisfactory and it is turned out that the wiring is hardly responsible for circulatory disturbances at the site of fracture, if solid internal fixation is obtained by other method such as intramedullary nailing. The wiring, when applied without other procedures for osteosynthesis, is sometimes insufficient for the internal firm fixation and pseudarthrosis often develops, as commonly well known. However, as confirmed by our clinical observation, it can be hardly supposed that the wiring itself provokes immediately the vascular disturbances at the site of fracture. The vascular disturbances, as a chief factor of pseudarthrosis, occur intermediately due to the lack of sustaining firm fixtion when adopted solely the wiring. The reason why the wiring without other method for osteosynthesis had been discarded by many surgeons are reduced to the difficulty of the sustenance of the firm fixation. Indeed, the wiring is of excellent supplementary method for the reduction and its maintenance of the third fragment when combined with the intramedullary nailing. Therefore, many cases of comminuted fracture are easily treated with satisfactory result by means of intramedullary nailing and wiring.

3) Screwing: As to the screwing with a metal plate, satisfactory result was obtained in one case of our series. But we performed hardly the osteosynthesis of the broken tibia with this method thereafter. The reason is as follows:

(1) On the surface of fragments which ought to be covered with the periosteum, lies a foreign body (metal plate).

(2) When a plate is attached to the anteromedial aspect of the tibia, where is a thin leyer of the skin and subcutaneous tissues with poor vascular supply, the wound healing might be lengthened.

Those are factors which could immediately and intermediately hinder the bone fusion. Therefore, we discarded the method.

Although the intramedullary nailing has the advantages of early weight-bearing and of certainty of bone fusion owing to the firm fixation, the screwing is indicated as better method in some cases of spiral and oblique fractures. But minute reduction of fragments is the essential requisites for the screwing. When precise reduction and its maintenance are obtained by means of the screwing, an ideal bone fusion is attained without massive callus formation at the site of fracture. Therefore, the screwing is not to be discarded in spite of many advantages of the intramedullary nailing.

SUMMARY

68 cases of fractures of the tibial shaft surgically treated from 1956 to 1966 were reviewed. The methods of treatment in the majority of cases were intramedullary nailing (43 cases) and screwing (21 cases). The intramedullary nailing was carried out with the exposure of fracture. It has the advantages of minute reduction of fragments. Satisfactory results were obtained in the cases of comminuted fracture by means of intramedullary nailing combined with wiring. The wiring was affirmed as an excellent supplementary method for the reduction and maintenance of the third fragment. Although the intramedullary nailing has the advantages of early weight-bearing and of the certainty of solid bone fusion, the screwing is better in some cases of spiral and oblique fractures.

REFERENCES

1) Alms, M. : Medullary Nailing for Fracture of the Shaft of the Tibia. J. Bone And Joint Surg. **44-B**, 328-339, 1962.
2) Ogihara, K. et al. : Experiences of Closed Intramedullary Nailing (2nd Report). Cent. Jap. J. Orthop. Tramaut. **9**, 653～654, 1966.
3) Kashiwagi, T. et al. : Experience with medullary nailing in our clinic. J. Jap. Orthop. Ass. **37**, 717～718, 1963.
4) Küntscher, G. : Praxis der Marknagelung. Friedlich-Karl, Schattauer-Verlag. Stuttgart, 1962.
5) Morita, S. et al. : Evalution of results Encirclement by Wire for Fracture of Long Bone. Surgery. **21**, 1076～1081.
6) Nagata, M. : A Clinical Study of Intramedullary Nailings for a Fresh Fracture of the Tibial Shaft (with special Reference to its Recovery Process and Operative Indication). Cent. Jap. J. Orthop. Tramaut. **9**, 446～495.
7) Okada, K. et al. : Treatment of Fractur of the lower log. J. Jap. Orthop. Ass. **37**, 718～719, 1963.
8) Zuckman, J. et al. : l'enclouage centro-médullaire du tibia dans le traitement des fractures diaphysaires de jambe récentes de l'adulte. Revue de Chirurgie Orthopédique. **51**, 475-490, 1965.

和文抄録

脛骨々幹部骨折にたいする観血的治療法

和歌山日赤整形外科

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脛骨々幹部骨折に対し観血的治療を行なつた症例は過去11年間に68例である．手術方法は主として髄内釘固定法（43例）及び螺子による固定法（21例）である．髄内釘固定は開放的に行なつた．これにより骨折の整復が確実かつ容易となるほか，特に粉砕骨折のさいには，第3骨片の整復及び保持の目的で鋼線締結法を併用して良好な結果が得られた．鋼線締結法の骨癒合に及ぼす影響を臨床的に慎重に検討したが，他の金属による強固な内固定と共に鋼線締結法を用いれば，鋼線締結それ自体は骨癒合に障害を及ぼさぬことを確認した．髄内釘固定法の利点は早期の体重負荷及び確実な骨癒合であるか，らせん骨折及び斜骨折の症例では螺子のみによる内固定がはるかに有利である．厳密な整復及びその保持により，過剰な仮骨形成がなく，早期に骨癒合が達成される．